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FOURTH MONTHLY NARRATIVE REPORT

15 November 1965

REFERENCE

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Job No. 645

REPORTING INTERVAL

10 October 1965 - 10 November 1965

OBJECTIVE

The objectives of this program are to define the operational objectives for automatic screening of photographic intelligence data; to study, test, and evaluate the techniques applicable to the problem; and to generate a design for an operational prototype system. Extensive experimentation on existing scanning and processing equipment, coupled with computer simulations of recognition systems, will be used to test the feasibility of several schemes. The final system design will be based upon the results of the techniques study and the operational objectives defined in the program.

STATUS OF ACTIVITIES AND ACCOMPLISHMENTS

During the month, emphasis was on experimentation and further definition of military consideration of automatic and semi-automatic pattern recognition.

Declassification Review by NGA/DoD

Tests were conducted using the Laguerre time-domain filters
in place of the sine-wave time-domain filters. The new time-
domain measurements are being separated into classes by the

25X1 [   ] algorithm as were the previous ones, However,

since such research requires a decision logic output to ana-
lyze the results of an experiment, a series of diagnostic
tests (DT's) are being programmed to aid the experimenter
by giving him insight into the structure of the data at vari-
ous steps in an experiment. These tests now include analy-
zing histograms of the values of the time-domain filters, the
matrix of correlation values between histograms, and computer
printout of the values of the adjustable gains in the MADALINE
Decision Logic.

To introduce more generality into the experiments, time do-
main and frequence domain filter experiments are to be run
with the five classes of input imagery stipulated last month.
As each experiment is run, the results of the decision logic
and the diagnostic tests will be analyzed. This will lead to
a capability for predicting performance of a general class
of automatic equipment from only the microstructure of the in-
put data. This will be useful during the design of operation-
al equipment.

To aid us in the analysis of operational objectives, a three-
dimensional array has been developed which can be used for the
evaluation of automatic recognition equipment. A series of
situations are postulated for which reconnaissance may be re-
quired to answer the EEI's of a commander. The sponsor can

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select the situations, classes of targets, and types of imagery that are of interest to him and then by inspection of the array for that situation, determine the automatic equipment that will be required. This array is termed the Visual Intelligence Array (VIA). The array will have the coordinates of targets in the vertical direction and the types of imagery in the horizontal direction; situations will give depth. Thus, for any situation, a slice can be taken through the array and the equipment determined for the imagery and targets of interest.

The situations are as follows:

A. Arms Control - Reconnaissance to support a policied arms-control agreement.

B. Cold War/Crisis Management - Reconnaissance to prevent technological and military surprises, especially during a crisis (e.g., Cuba) and to observe various degrees of support for COIN forces (e.g., China).

C. COIN/Revolutionary - Reconnaissance to support the defense of a third nation against intruders or internal revolutionaries.

D. Limited War - Reconnaissance to support the escalation of a COIN/Revolutionary situation where many nations are involved with regular troops (e.g., W.W. II).

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E. Central War - All areas of the world come under attack by nuclear or conventional weapons or are held hostage by threat of their use.

For each situation, we have [   ] photographic imagery of the following kinds of targets:

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A. FEBA to 25 miles

    1. Perishable, less than five feet, (typically COIN)

    2. Perishable, greater than 5 feet.

    3. Fixed

B. Twenty-five to two hundred miles from FEBA

    1. Perishable, less than five feet

    2. Perishable, greater than five feet

    3. Fixed

C. Two hundred miles and greater from FEBA

    1. Perishable, less than five feet

    2. Perishable, greater than five feet

    3. Fixed

D. Post-attack Intelligence

This array serves as a working document and is being modified daily.

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To do automatic interpretation, several modules will be required.
They include ones for screening, detail analysis, storage and re-
trieval, and change detection. The complete detail of these mod-
ules will use portions of the experimental program now under way.
Each module has been blocked out. As the experiments progress,
the level of detail for each module is increased until, by the
conclusion of the program, the complete system design will be fin-
ished.

DIFFICULTIES ENCOUNTERED
The lack of exemplary imagery still limits the program.

TECHNICAL AGREEMENTS MADE
None

PROGRAM FOR NEXT INTERVAL
During the next reporting period, emphasis will be placed on ex-
perimentation with existing equipment, the development of more
diagnostic tools, and the continuing search for imagery.

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